CLAIMS

What is claimed is:

1. A radiation shielded multi-chip module, comprising:
(a) a base constructed from a radiation shielding material with a plurality of non-conducting feed throughs; and
(b) a substrate with a plurality of integrated circuit devices attached to a top side of said substrate and a plurality of integrated circuit devices attached to a bottom side of said substrate, wherein said substrate is attached to the inside of said base; and
(c) a lid constructed from a radiation shielding material, wherein said base is secured to an inner surface of said base member; and
(d) a plurality of package leads passing through said plurality of non-conducting feed throughs in said base and electrically attached to said plurality of integrated circuit devices.

2. A radiation shielded multi-chip module according to claim 1, wherein said radiation shielding material is comprised of a high Z/low Z alloy.

3. A radiation shielded multi-chip module according to claim 1, wherein said radiation shielding material is comprised of a high Z material.

4. A radiation shielded integrated circuit device according to claim 1, wherein said radiation shielding material is comprised of a Copper Tungsten alloy.

5. A radiation shielded multi-chip module according to claim 1, wherein said radiation shielding material is comprised of Tungsten.

6. A radiation shielded multi-chip module according to claim 1, wherein a plurality of die attach slugs composed of radiation shielding material are disposed between and attached to said substrate and said plurality of integrated circuit die.

7. A radiation shielded multi-chip module as recited in claim 1, wherein a thickness of said base and said lid is determined by,
a calculation of the radiation for a specific task; and
a total radiation dose tolerance of all integrated circuits attached to said base; and
a radiation transport calculation, wherein the thickness of said shielding material is calculated as a function of said radiation for a specific task, said total radiation dose tolerance, and the density and thickness of said shielding material and is derived from said radiation transport calculation.

8. A radiation shielded multi-chip module, comprising:
(a) a top lid and side-wall combination composed of a radiation shielding material; and
(b) a bottom lid and side-wall combination composed of a radiation shielding material;

and

(c) a substrate with a plurality of integrated circuit devices attached to a top side of said substrate and a plurality of integrated circuit devices attached to a bottom side of said substrate, wherein said substrate is attached to said top and said bottom lid and side-wall combination by a seal ring on said substrates top and bottom surface; and

(d) a plurality of package leads attached electrically to said plurality of integrated circuit devices and mechanically attached to said substrate.

9. A radiation shielded multi-chip module as recited in claim 8, wherein the thickness of said base and said lid is determined by,

(a) a calculation of the radiation for a specific task; and

(b) a total radiation dose tolerance of all integrated circuits attached to said base; and

(c) a radiation transport calculation, wherein the thickness of said shielding material is calculated as a function of said radiation for a specific task, said total radiation dose tolerance, and the density and thickness of said shielding material and is derived from said radiation transport calculation.

10. A radiation shielded multi-chip module as recited in claim 8, wherein said radiation shielding material is comprised Tungsten.

11. A radiation shielded multi-chip module as recited in claim 8, wherein said radiation shielding material is comprised of a high Z/low Z material.

12. A radiation shielded multi-chip module as recited in claim 8, wherein said radiation shielding material is comprised of a Copper Tungsten alloy.

13. A radiation shielded multi-chip module as recited in claim 8, wherein said radiation shielding material is comprised of a high Z material.

14. A radiation shielded multi-chip module as recited in claim 8, wherein said seal ring makes a hermetic seal between said top and said bottom lid and side-wall combination and said substrate.

15. A radiation shielded multi-chip module as recited in claim 8, wherein said top lid and side-wall combination or said bottom lid and side-wall combination has a small hole to allow for venting during sealing, and said small hole is subsequently sealed to maintain a hermetic seal.

16. A radiation shielded multi-chip module as recited in claim 8, wherein said plurality of integrated circuit devices are electrically attached by a plurality of screened interconnects within said substrate, said screened interconnects are electrically attached to said plurality of package leads.

17. A radiation shielded multi-chip module, comprising:

(a) A top side-wall; and

(b) A bottom side-wall; and

(c) A substrate comprised of a plurality of integrated circuit devices attached to a top side

of said substrate and a plurality of integrated circuit devices attached to a bottom side of said substrate, wherein said top side of said substrate is attached to the bottom side of said top side-wall, and said bottom side of said substrate is attached to the top surface of said bottom side-wall; and

(d) A top lid constructed from a radiation shielding material, wherein said top lid is hermetically sealed to the top surface of said top side-wall; and

(e) A bottom lid constructed from a radiation shielding material, wherein said bottom lid is hermetically sealed to the bottom surface of said bottom side-wall; and

(f) A plurality of package leads attached electrically to said plurality of integrated circuit devices.

18. A radiation shielded multi-chip module as recited in claim 17, wherein said top lid and said bottom lid are composed of a high Z/ low Z alloy.

19. A radiation shielded multi-chip module as recited in claim 17, wherein said top lid and said bottom lid are composed of a high Z material.

20. A radiation shielded multi-chip module as recited in claim 17, wherein said top lid and said bottom lid are composed of a Copper Tungsten alloy.

21. A radiation shielded multi-chip module as recited in claim 17, wherein said top lid and said bottom lid are composed of a Tungsten.

22. A radiation shielded multi-chip module as recited in claim 17, wherein

(a) said top lid is comprised of

(1) a first top lid which is composed of a packaging material and

(2) an inner top lid composed of a radiation shielding material attached to said first top lid, wherein said first top lid makes a seal with said top surface of said side wall; and

(b) said bottom lid is comprised of

(1) a first bottom lid which is composed of a packaging material and

(2) an inner bottom lid composed of a radiation shielding material and attached to said first bottom lid, wherein said first bottom lid makes a seal with said bottom surface of said side wall.

23. A radiation shielded multi-chip module as recited in claim 22, wherein said radiation shielding material is comprised of a high Z/ low Z material.

24. A radiation shielded multi-chip module as recited in claim 22, wherein said radiation shielding material is comprised of a Copper Tungsten alloy.

25. A radiation shielded multi-chip module according to claim 17, further including, a plurality of die attach slugs composed of radiation shielding material that are disposed between and attached to said substrate and said plurality of integrated circuit die.

26. A radiation shielded multi-chip module as recited in claim 17, wherein a shielding ring composed of a radiation shielding material is attached to said top and said bottom surface of said substrate.

27. A radiation shielded multi-chip module, comprising:

(a) a dual cavity base with a top well and a bottom well and with a plurality of non-conducting feed throughs; and

(b) a top substrate with a plurality of integrated circuit devices attached to a top side of said top substrate, wherein said top substrate is attached to the inside surface of said top well on said dual cavity base; and

(c) a bottom substrate with a plurality of integrated circuit devices attached to a bottom side of said bottom substrate wherein said bottom substrate is attached to the inside surface of said bottom cavity of said dual cavity base; and

(d) a top lid comprised of radiation shielding material which is attached to said top well of said dual cavity base forming a sealed cavity; and

(e) a bottom lid comprised of radiation shielding material which is attached to said bottom well of said dual cavity base forming a sealed cavity; and

(f) a plurality of package leads passing through said plurality of non-conducting feed throughs in said dual cavity base and electrically attached to said plurality of integrated circuit devices.

28. A radiation shielded multi-chip module as recited in claim 27, wherein said radiation shielding material is comprised of a high Z/low Z material.

29. A radiation shielded multi-chip module as recited in claim 27, wherein said radiation shielding material is comprised of a Copper Tungsten alloy.

30. A radiation shielded multi-chip module as recited in claim 27, wherein said radiation shielding material is comprised of Tungsten.

31. A radiation shielded multi-chip module as recited in claim 27, wherein said radiation shielding material is comprised of a high Z material.

32. A radiation shielded multi-chip module as recited in claim 27, wherein

(a) said top lid is comprised of

(1) a first top lid which is composed of a packaging material and

(2) an inner top lid composed of a radiation shielding material attached to said first top lid, wherein said first top lid makes a seal with a top surface of said dual cavity base; and

(b) said bottom lid is comprised of

(1) a first bottom lid which is composed of a packaging material and

(2) an inner bottom lid composed of a radiation shielding material attached to said first bottom lid, wherein said first bottom lid makes a seal with a bottom surface of said dual cavity base.